Wireless devices with particular data rates or quality of service requirements can be given priority over other types of wireless devices by setting one probability value equal to a factor times another probability value as was described for ongoing transmissions versus new transmissions.

The probability of transmission value is sent to a wireless device from the processor 384 in FIG. 7 via its output 386 and the conductors 388 and 348, to the input 350 of the transmitting antenna 352. The processor 384 preferably produces a probability signal in the form of a digitally modulated downlink carrier frequency signal for broadcasting to all the wireless devices of a particular type. The probability signal is transmitted from the antenna 352. Alternatively, the processor 376 can send the load data, in this instance comprising the equivalent current load value K and equivalent population value N, directly to the wireless device which can determine the probability of transmission value based on the load data.

FIG. 8 is a schematic of a wireless device 410 in accordance with the present invention. The wireless device 410 comprises a receiving antenna 414, a bandpass filter 422, a demodulator 462, a processor 430, a random generator 440, a packet generator 448 and a transmitting antenna 456.

The receiving antenna 414 is connected via its output 416 and the conductor 418 to the input 420 of the bandpass filter 422. The bandpass filter 422 is connected via its output 424, and the conductor 426 to the input 460 of the demodulator 462. The demodulator 462 is connected via its output 464 to the conductor 466 and an input 428 of the processor 430. The processor 430 is connected via its output 432 and the conductor 434 to an input 438 of the random generator 440. The demodulator 462 is connected via its output 464 and the bypass conductor 436 to an input 438 of the random generator 440 which is connected via its output 442 and the conductor 444 to an input 446 of the packet generator 448. The packet generator 448 is connected via its output 450 and the conductor 452 to the input 454 of the transmitting antenna 456.

In operation, a load data modulated signal and/or probability data modulated signal is received at the wireless device 410 from a base station, such as the base station 310 of FIG. 7, by receiving antenna 414. The modulated signal passes through the bandpass filter 422 via its input 420 and its output 424. The filtered signal is demodulated by the demodulator 462 and is sent via the output 464 and the conductor 466 to the input 428 of the processor 430. The processor 430 calculates a probability of transmission value for this wireless device based on the load data received. The load data will normally include an equivalent current load value K and an equivalent population value N, which have been described with reference to the base station of FIG. 7.

After the probability of transmission value for the wireless device 410 is determined by the processor 430, it is sent from the processor 430 via its output 432 and conductor 434 to the input 438 of the random generator 440. The random generator 440 produces a random number based on the given probability value and the random number determines if transmission from the wireless device 410 will occur at this particular time. If transmission should occur, the random generator 440 produces an enable signal at its output 442 and sends the enable signal to the packet generator 448 via conductor 444 and input 446. The packet generator 448 will then be enabled to send packets via its output 450 and the conductor 452 to input 454 of the transmitting antenna 456 for transmission. Alternatively, operations performed by processor 430, random generator 440, and packet generator 448 can be combined into a single processor.

Further, the signal from the demodulator 462 may be sent from its output 464 through the bypass conductor 436 directly to the input 438 of the random generator 440. This can occur if the base station is transmitting probability of transmission values instead of load data. Other than bypassing the processor 430, the remaining operation of the circuit of FIG. 8 would be as described previously.

Referring to FIGS. 9, 10, and 11, a method for statistically controlling transmission by wireless devices through a base station, such as the base station 310 of FIG. 7, is shown. FIG. 9 is a flow chart 500 of the update operation of the equivalent current load value, K, which occurs when a wireless device transmits a modulated spread signal to the base station. The modulated spread signal is received at step 502 and is partially despread by a despreader, such as the despreader 336 in FIG. 7, using a unique code at stop 504. The partially despread signal ("PDS") is then demodulated at step 506 and the data rate and quality of service requirements are determined from the demodulated signal and the code used for partial despreading. The value for the number of active wireless devices of type i, K_i is stored in a memory, such as the memory 377 in FIG. 7, and is incremented if this is a new active wireless device, in step 508. The equivalent current load value K, also stored in memory, is then updated at step 510 based on the new value k_i and the values (k_{i+1}, k_{i+2}, . . .) and the data rate and quality of service requirements for all active wireless devices as previously described. Alternatively the equivalent current load value K can be updated independently of updates to a particular k_i by sampling all k_i's after particular intervals of time. In addition, current load shares K_i can be calculated as previously described.

FIG. 10 is a flow chart 600 for the update operation of the equivalent population value N by a processor such as the processor 376 in FIG. 7. An admission request which includes the type of wireless device is received at step 602 via an admission receiver, such as the receiver 358 in FIG. 7. If the new wireless device is admitted, the population of that type of wireless device, n_i, is updated and stored in a memory such as the memory 377 at step 604. The new n_i, is then used to update the equivalent population value, N, which is also stored in the memory at step 606. Alternatively, the equivalent population value N can be updated independently of updates to a particular n_i by a processor sampling all n_i's in memory (n_i, n_{i+1}, . . .) after particular intervals of time. Population shares N_i, can also be calculated as previously described.

FIG. 11 is a flow chart 700 for the transmission of load data or probability data in accordance with the present invention. Values for the equivalent population value N and the equivalent current load value K, are retrieved at step 702 by a processor such as the processor 376 from a memory, such as the memory 377 of FIG. 7. N and K can be transmitted to wireless devices at step 704 so that the wireless devices can determine the probability of transmission values. Optionally, the probability of transmission values can be determined by the base station at step 706 from N and K. The probabilities can then be transmitted to wireless devices at step 708.

The present invention provides the capability of adequately servicing wireless devices with different data and different quality of service requirements. The statistical access technique of the present invention provides for efficient use of a designated frequency spectrum wherein access to a base station can be prioritized for different types of wireless devices.

We claim:

1. A base station for controlling access by wireless devices of mixed types to an uplink frequency channel comprising: